



Tactical Control System Human Computer Interface Overview

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TCS HCI Requirements - ORD

- 24 HCI Related ORD Requirements

- 8 What to Display Reqs.

- 5 How the HCI will look Reqs.

- 11 Other HCI related Reqs.



TCS HCI Requirements - ORD

ORD001	Although developed as a total package, the TCS will [ORD001] have the capability to be configured and down-scaled to meet the user's deployability or operator limitations.
ORD002	The software will [ORD002] provide a high resolution, computer generated, graphics user interface that enables a UAV operator that is trained on one system to control different types of UAVs or UAV payloads with minimal additional training.
ORD004	The software developed will be Defense Information Infrastructure/Common Operating Environment (DII-COE) compliant, ...
ORD014	Since not all recipients of UAV information require all levels of TCS capabilities, the software, and software related hardware, if required, will [ORD014] be developed so that it is scaleable to meet users' needs.
ORD019	The TCS will (c) Have ergonomically designed operator controls and displays [ORD019]. Controls can be operated by operators in cold weather clothing or in a Mission Oriented Protective Posture. (threshold)
ORD020	The TCS will (d) Have monitor(s) that provide easy reading of displays (threshold) [ORD020].
ORD021	The TCS will (e) Be menu driven and have displays in a X-windows motif (threshold) [ORD021].
ORD024	The TCS will (h) Allow operators to have simultaneous flight and payload control of at least two air vehicles, beyond line of sight, using one TCS (threshold) [ORD024] (KPP).



TCS HCI Requirements - ORD

ORD043	The system will [ORD043] be ergonomically designed and provide sufficient cues to allow the pilot to safely take off, land and navigate under Instrument Flight Rules (threshold).
ORD045	During mission execution, the TCS will: (a) Display the location and systems status of the UAV (threshold) [ORD045].
ORD046	During mission execution, the TCS will: (b) Display the search footprint of the payload on the moving map (threshold) [ORD046].
ORD047	During mission execution, the TCS will: (c) Provide dynamic mission and sensor retasking during operational mission execution (threshold) [ORD047].
ORD048	During mission execution, the TCS will: (d) Receive, process, format, store and retrieve flight and payload data and perform limited exploitation of payload data (threshold) [ORD048].
ORD049	During mission execution, the TCS will: (e) Have the capability to receive and control payloads on a UAV that is being controlled from another TCS (threshold) [ORD049].
ORD050	During mission execution, the TCS will: (f) Provide the capability to pass control of a UAV from one TCS to another (threshold) [ORD050].
ORD051	During mission execution, the TCS will: (g) Provide the operator a caution/warning when the UAV system has identified a malfunction (threshold) [ORD051].

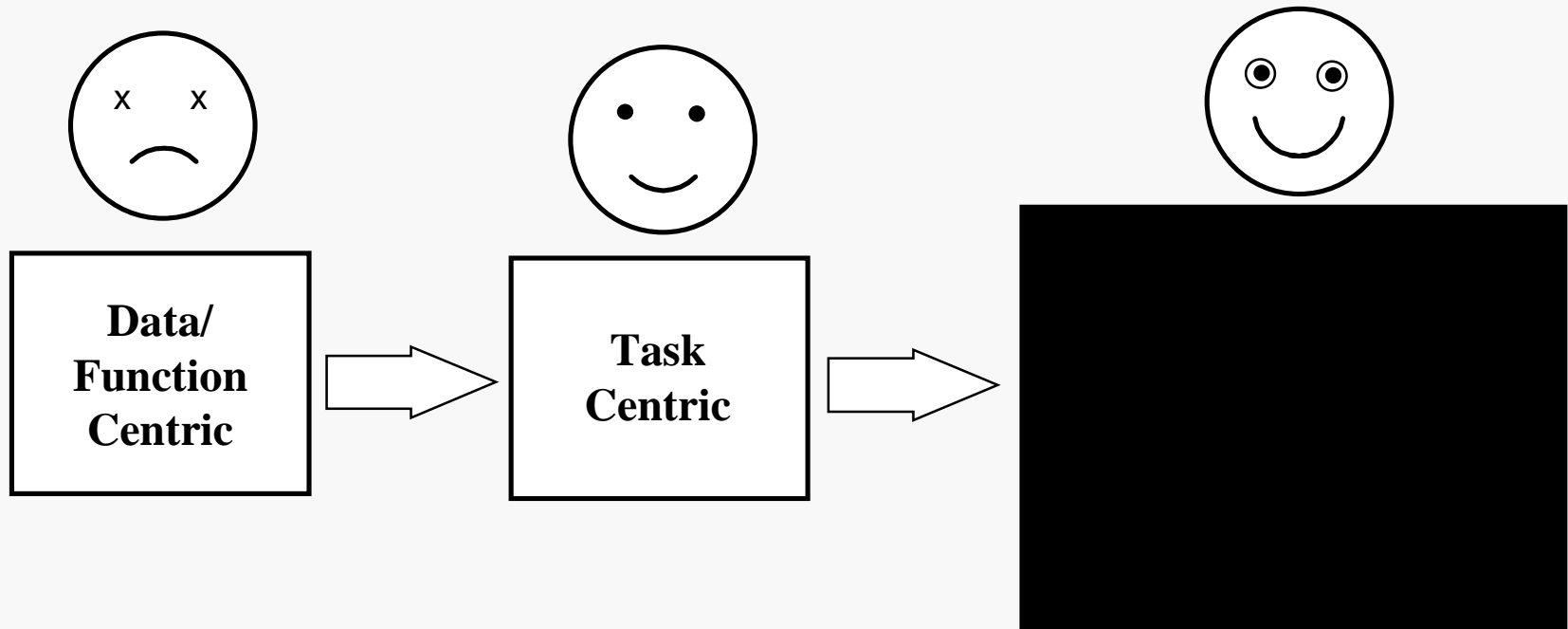


TCS HCI Requirements - ORD

ORD052	During mission execution, the TCS will: (h) Enable antenna switching when the UAV is masked by obstructions (threshold)[ORD052].
ORD053	The TCS shall [ORD053] provide limited exploitation capabilities, to include voice and textual reporting for spot/mission objectives.
ORD054	TCS imagery processing work stations shall include, but not be limited to: (a) Video/SAR frame grabbing, image annotation, image archiving, and video/SAR recording/playback, and data dissemination (threshold) [ORD054].
ORD056	TCS imagery processing work stations shall include, but not be limited to: (c) The capability to display Near-Real Time (NRT) imagery with annotation to include date/time group, target location when in the center field of view, north seeking arrow , AV po
ORD057	TCS imagery processing work stations shall include, but not be limited to: (d) Built-in word processing and text capability including the ability to overlay textual information on imagery (threshold) [ORD057].
ORD062	TCS imagery processing work stations shall include, but not be limited to: (i) The capability to select/deselect cross hairs (or other similar ICON) to identify center of target (threshold) [ORD062].
ORD063	TCS imagery processing work stations shall include, but not be limited to: (j) The capability to display target symbols (threshold)... [ORD063].
ORD123	... in variable sizes (objective) [ORD123].

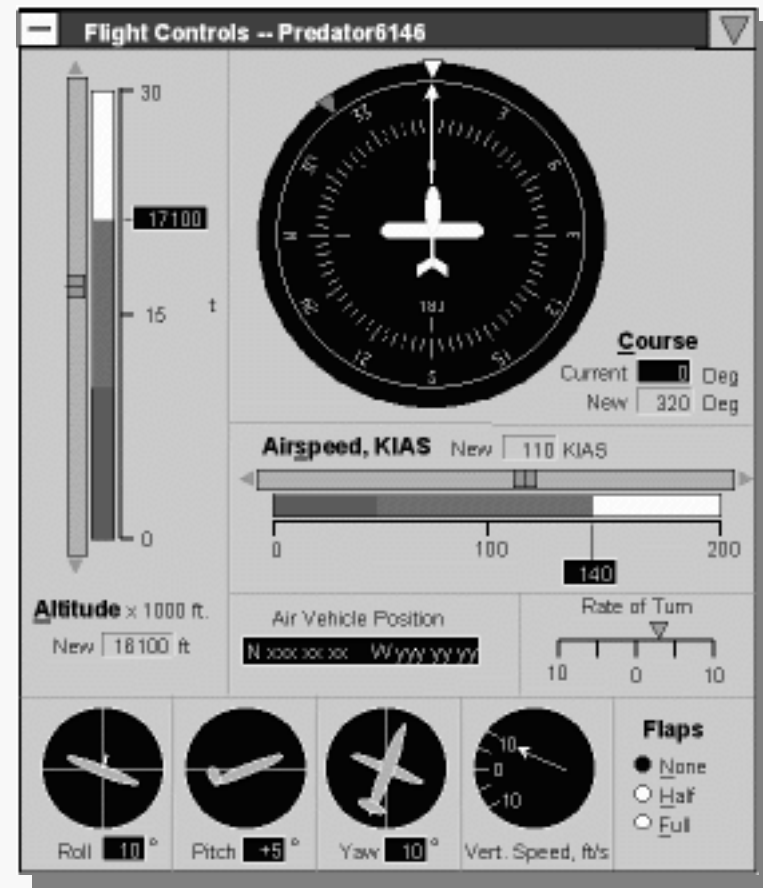
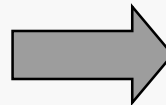


HCI DESIGN PHILOSOPHY





HCI DESIGN PHILOSOPHY





HCI DESIGN PHILOSOPHY

DRIVERS

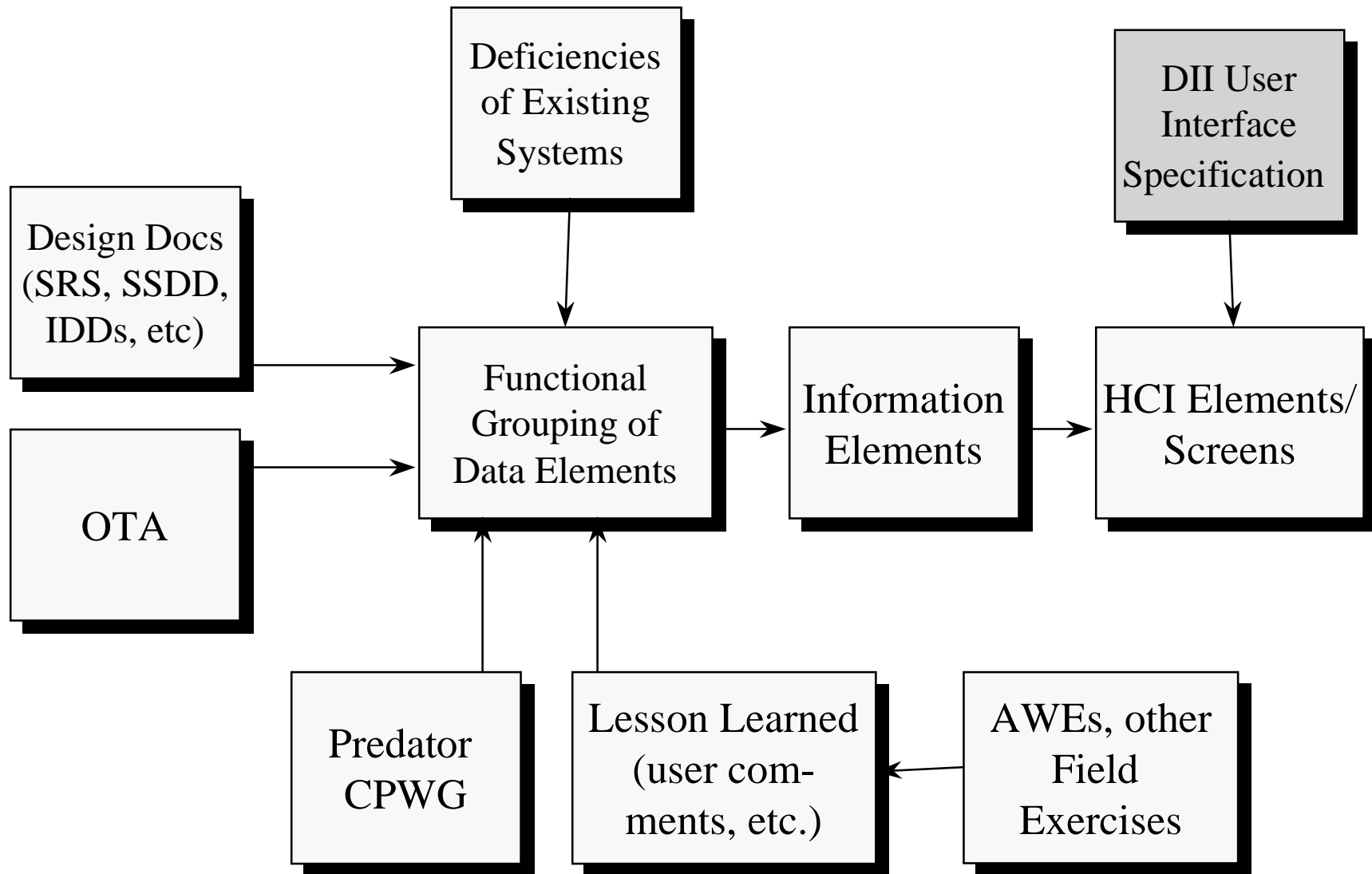
- Lessons Learned
- Situation Awareness
- Manageable Complexity
- AV Safety
- Fail Safe Control
- Mission Success
- Growth
- Compliance
- Commonality

KEY CONCEPTS

- Graphic/Iconic Screens
- “Operator Assistant”
- “Behind the Screens”
S/W support
- Information (Not Data)
- Information Coding

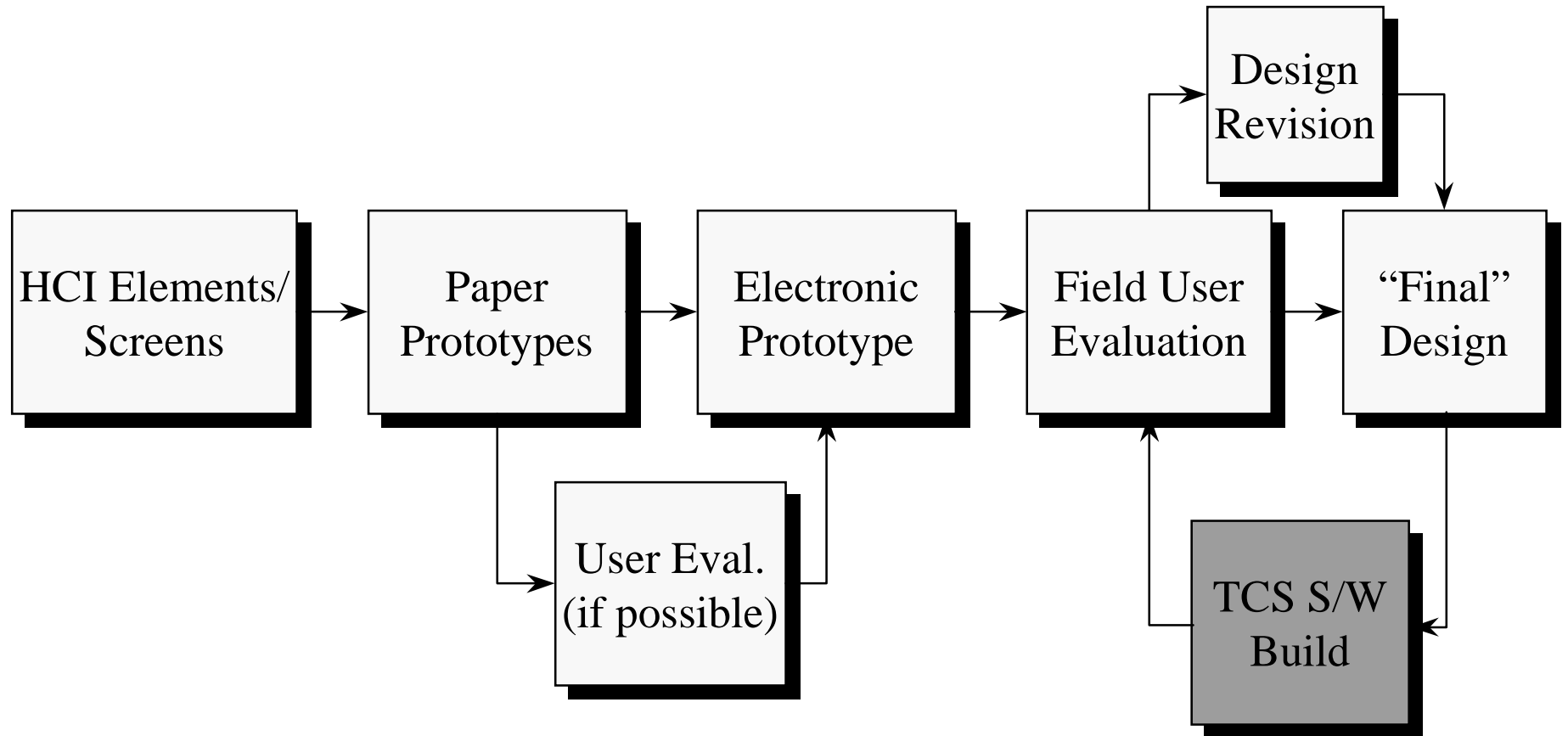


TCS HCI DESIGN PROCESS





TCS HCI DESIGN PROCESS

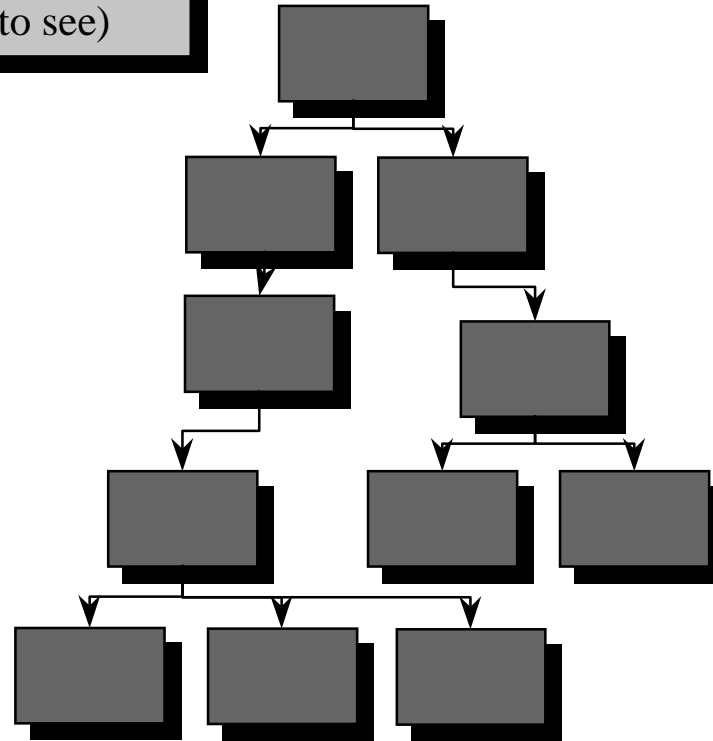
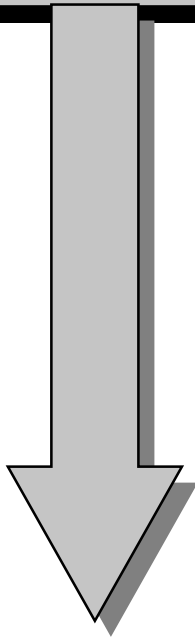




HCI DESIGN IMPLEMENTATION

TOP DOWN APPROACH

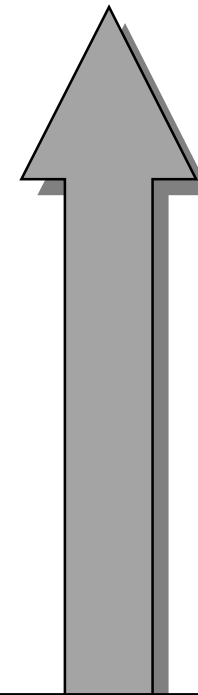
(What Training would like to see)



**TCS HCI PROCESS IS
COMBINATION OF BOTH**

BOTTOM UP APPROACH

(What Build Plan/Schedule is forcing us to do)





HCI GROUPINGS

Under HCI Control

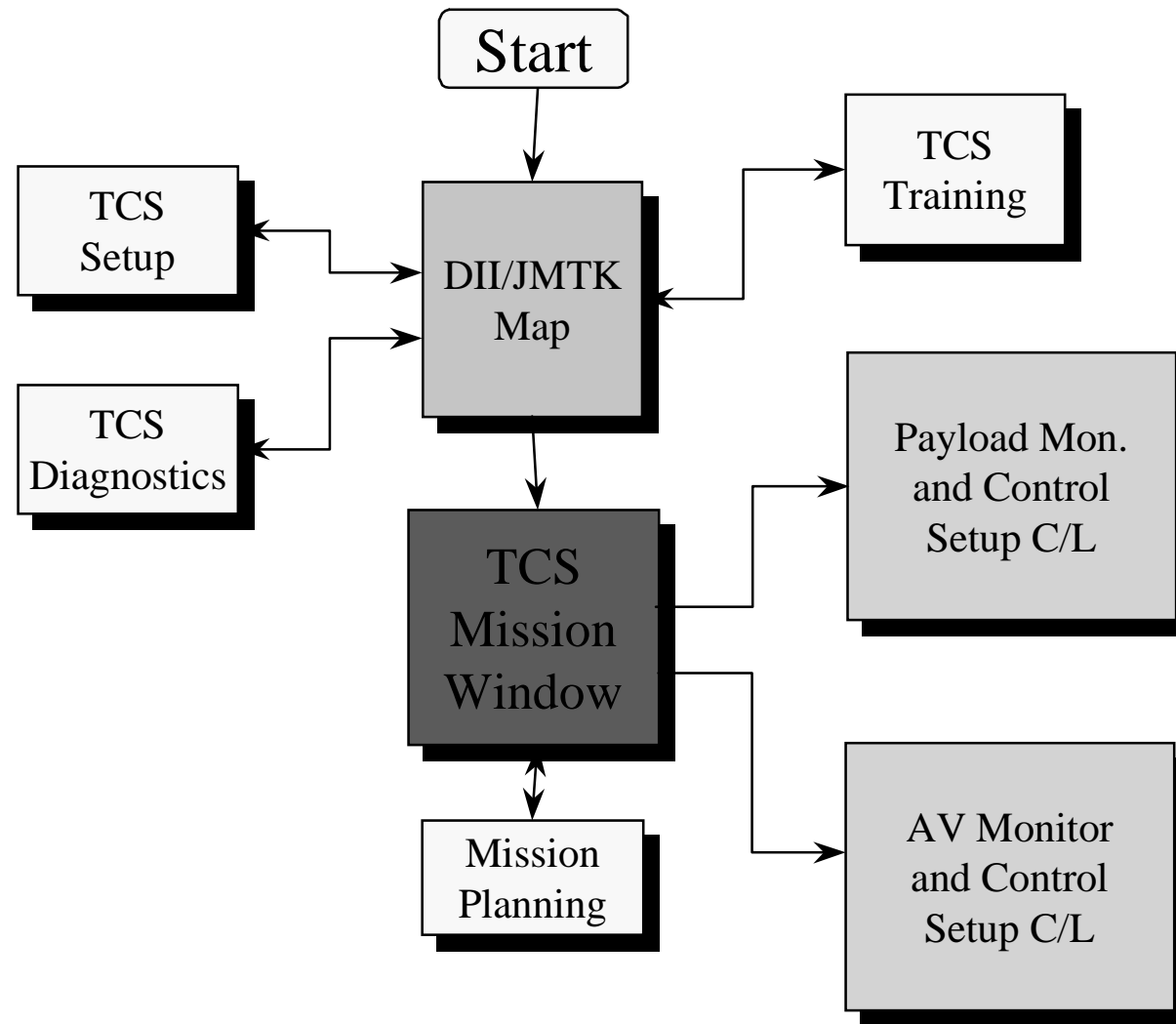
- Air Vehicle Status
- Air Vehicle Control
- Datalink Status
- Datalink Control
- GDT Status
- GDT Control
- Mission Planning
- Training
- Payload Status
- Payload Control
- Payload Data Dissemination
 - Video Mux Control
 - Live Video Window
 - Still Frame Annotation
 - TDBM Entry
 - USMTF Message Generation

Not Under HCI Control

- Computer Setup
- Other DII Segments

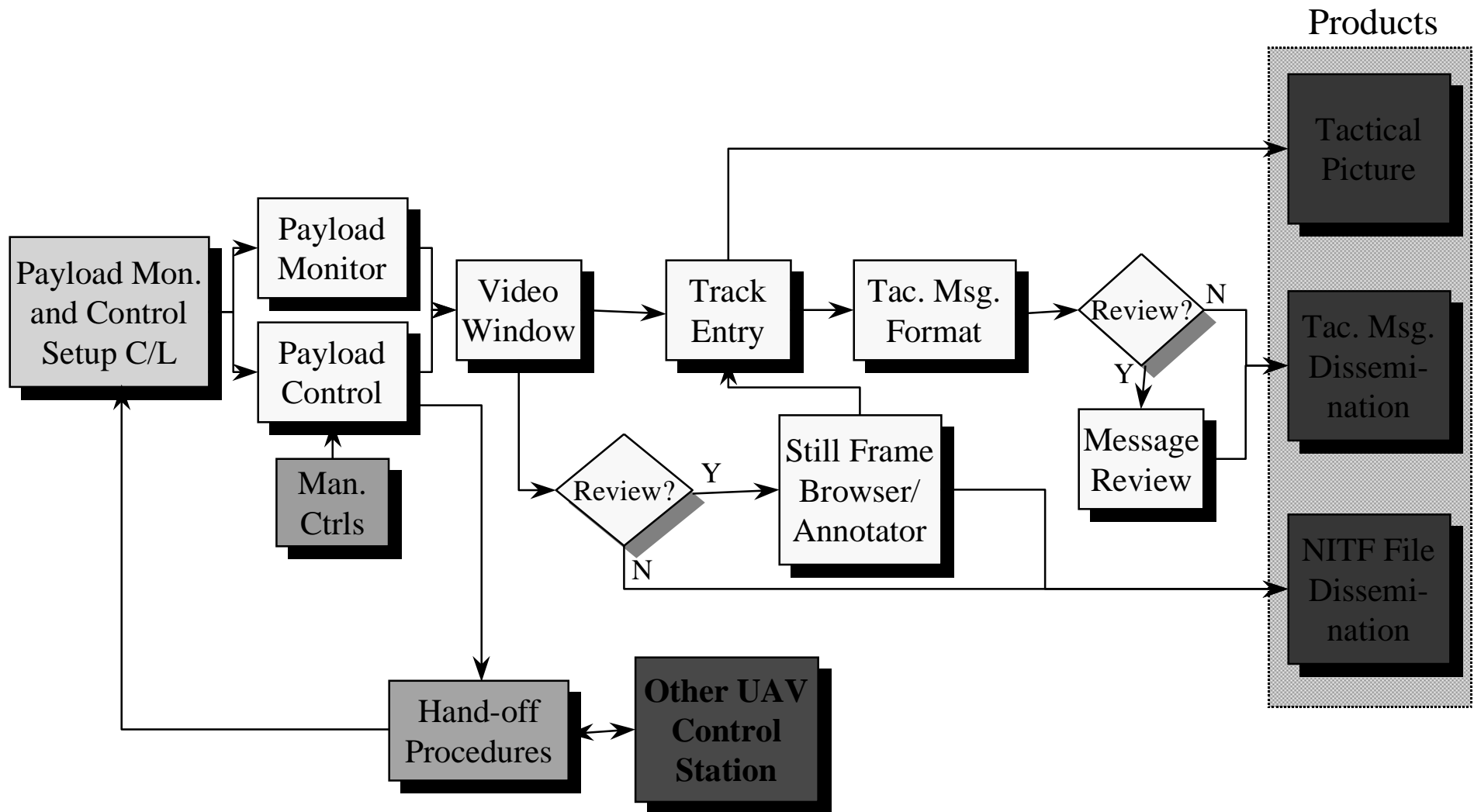


HCI TASK FLOW



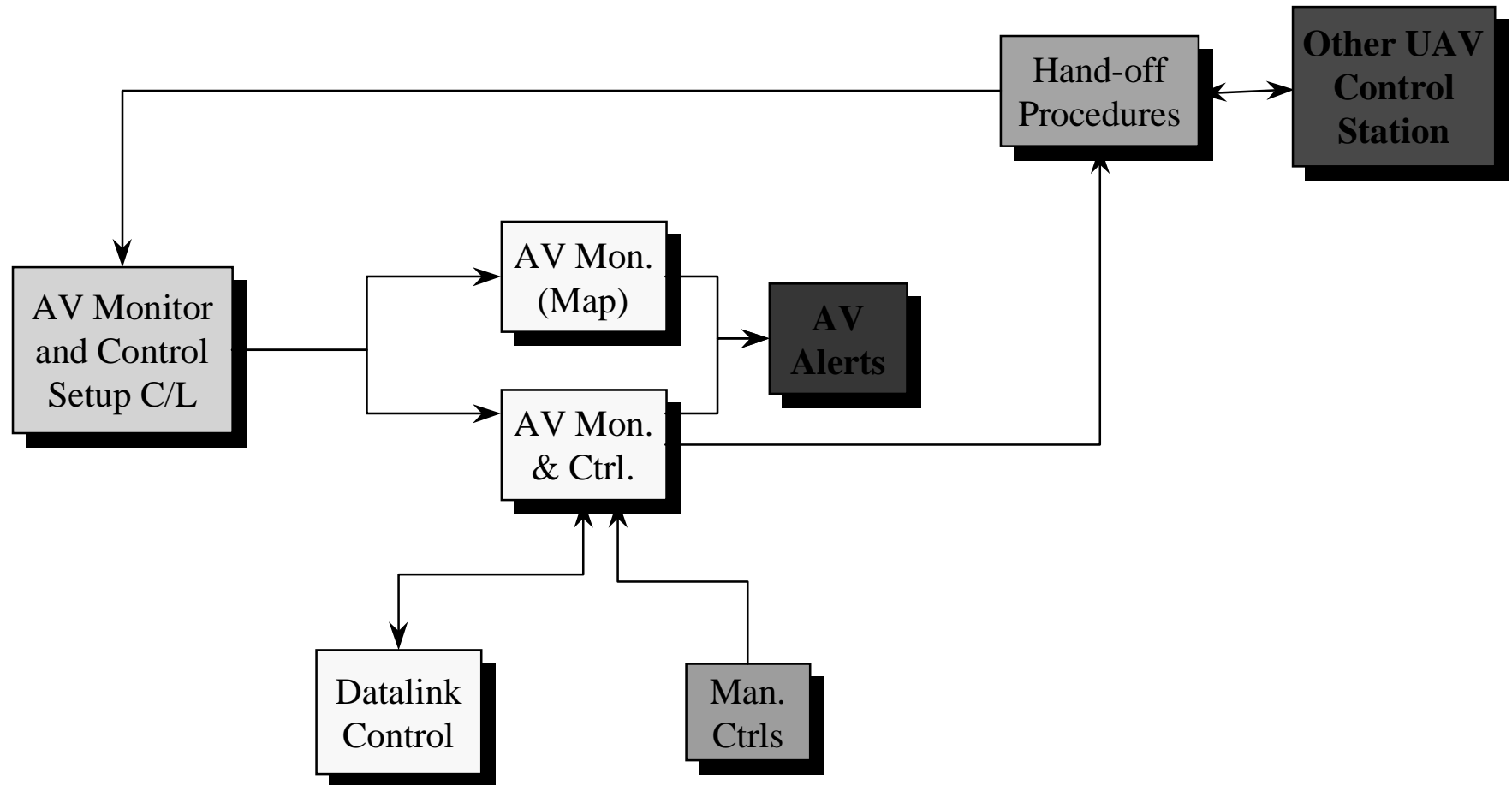


HCI TASK FLOW





HCI TASK FLOW





Track Entry/ RECCEXREP Formatting Development

Design Documents/Info:

- DII -- Required DII Track Entry Fields
- Joint Pub 6-04.41 -- Required RECCEXREP Message Fields
- ASAS Interface Design Document

Grouping of Data/Info Elements

- Specific Track Entry/RECCEXREP Info will be entered on same window
- Non-changing/default info will be entered in the Tac Msg defaults window



Track Entry/ RECCEXREP Formatting Development

Required Data/Information Elements:

- | | |
|----------------------------|------------------------|
| -Track Classification | -Track Type |
| -Track Class | -Position |
| -Number of Targets | -Time |
| -Heading | -Speed |
| -Short Name | -Long Name |
| -Country Code | -Threat Code |
| -Country of Sighting | -Alert Code |
| -Organization Type | -Echelon |
| -Weather Conditions | -Other Conditions |
| -Additional Info/Narrative | -National Tasking Ind. |

20 Elements in all



Track Entry/ RECCEXREP Formatting Development

Electronic Prototype.
Currently in Build 1.1
(EB2)

TDBM Entry

Track Type:

Class:

Country Code:

Threat:

Org Type:

Echelon:

Position:

Time:

Heading: Degrees

Speed: Knots

Classification:

Alert Code:

Short Name:

Long Name:

OK Apply Reset Cancel

Enter Long Name

IO	AFD	BRITISH INDIAN OCEAN
IP	NEU	CLIPPERTON ISLAND
IR	SUS	IRAN
IS	AFD	ISRAEL
IT	AFD	ITALY

AMBL	AIR MOBILE
AMBLINF	AIR MOBILE INFANTRY
AAM	AIR-TO-AIR MISSILE
ASM	AIR-TO-SURFACE MISSILE
AMPHASLT	AMPHIBIOUS ASSAULT

BDE	BRIGADE
CMBTCMD	COMBAT COMMAND
CMD	COMMAND
CO	COMPANY
CORPS	CORPS



Track Entry/ RECCEXREP Formatting Development

Revised Prototype

TDBM Track Entry

Track Type: Class: Alert Code:

Country Code: Threat: Country of Sighting:

AA NEU ARUBA	AA NEU ARUBA
AC AFD ANTIGUA AND BARBUD	AC AFD ANTIGUA AND BARBUD
AF AFD AFGHANISTAN	AF AFD AFGHANISTAN
AG SUS ALGERIA	AG SUS ALGERIA
AJ SUS AZERBAIJAN	AJ SUS AZERBAIJAN

Org. Type: Echelon:

ADMIN ADMINISTRATIVE	AIRARMY AIR ARMY
ABN AIRBORNE	AIRCMD AIR COMMAND
ABNCMDO AIRBORNE COMMAN	AIRCO AIR CONTROL PARTY
ABNINF AIRBORNE INFANTRY	AIRCRPS AIR CORPS
AIRCAV AIR CAVALRY	AIRDET AIR DETACHMENT

Time: Short Name:

Position: Long Name:

Number of Targets:

Speed: knots Heading:

Major Weather Condition:

Other Condition:

Narrative...

Basic Encyclopedia Number:

Target Category:

National Tasking Indicator:

Status Area



Track Entry/ RECCEXREP Formatting Development

Final Design

Currently in
Work

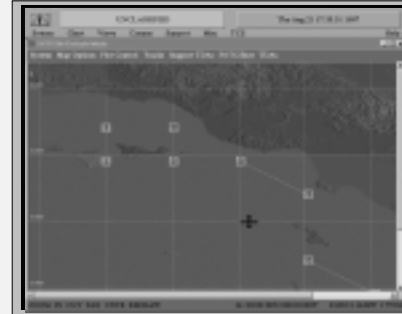


Primary Displays Allocation

DII/Map



DII/Map



AV Monitor
& Control



Payload
Monitor &
Control

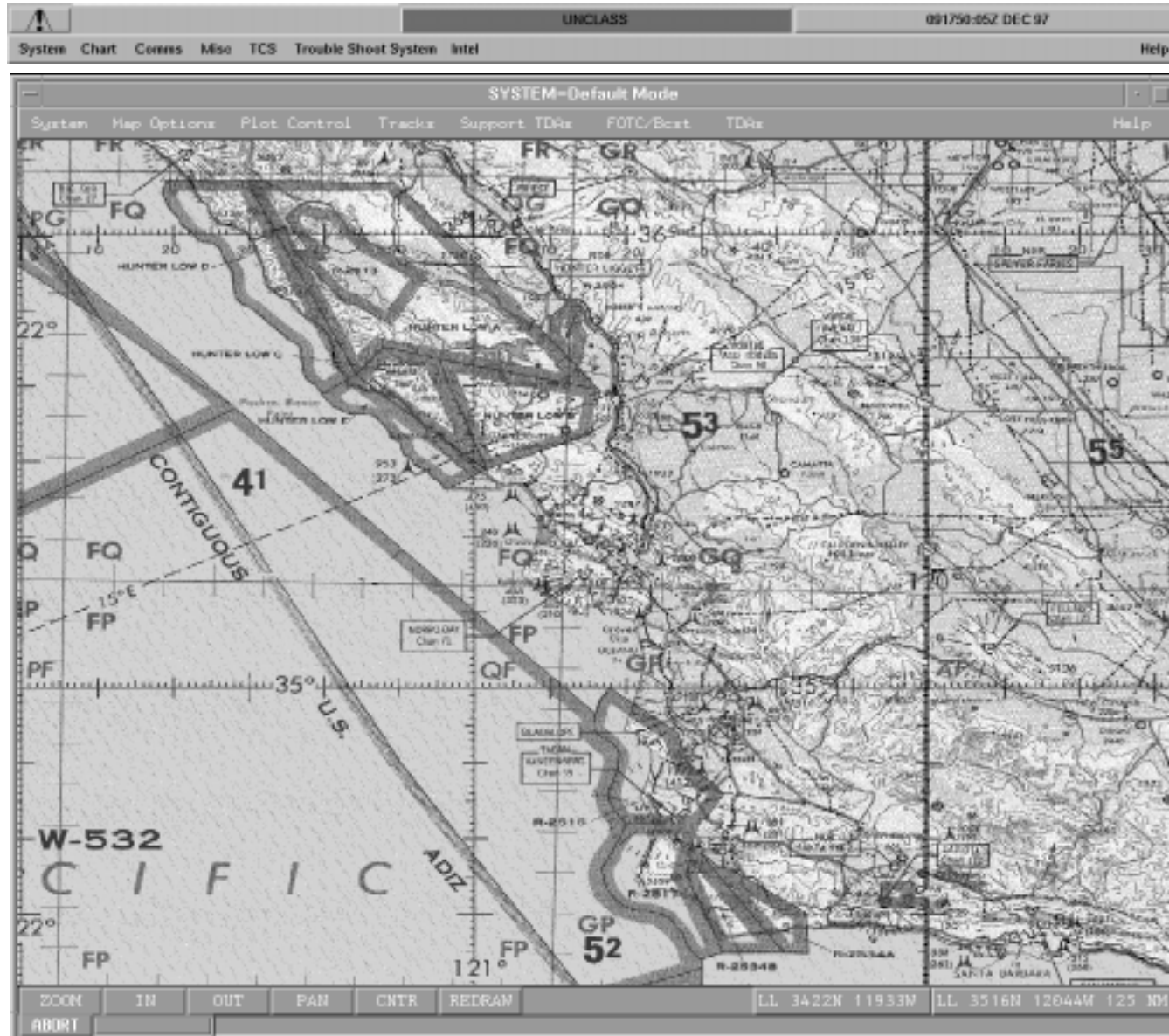


“AVO”

“MPO”



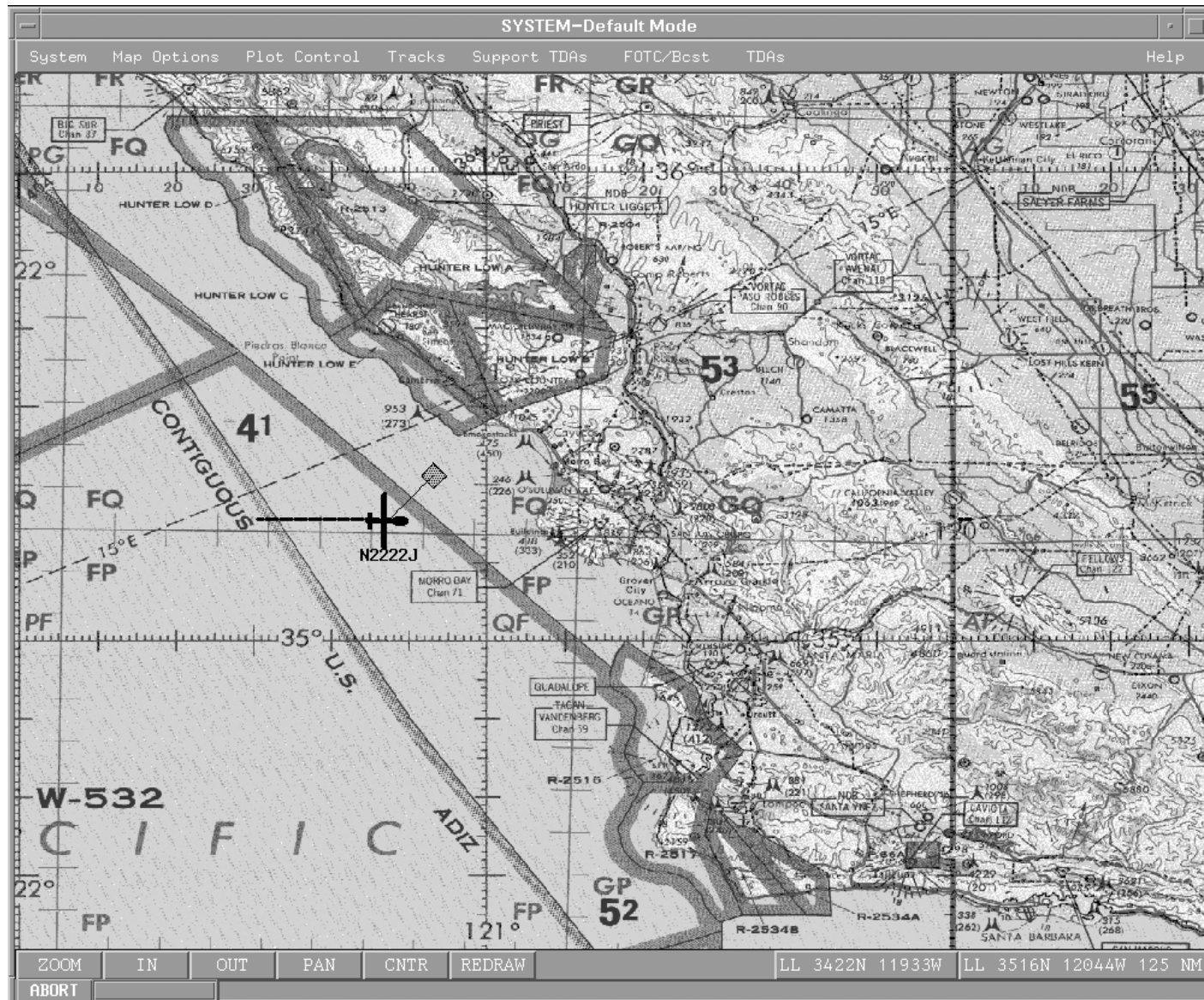
Build 1.1 Screen Shots





Build 1.1 Screen Shots







Build 1.1 Screen Shots

N222J Preferences

	Color	State
AV Icon	Green	Off
AV Tail Number	Red	On
AV Trail	Brown	On
Payload Footprint	Orange	On

N222J Status

Airspeed	100	knots
Altitude	10000	feet
Position	35-15-00N 120-48-24W	<input type="checkbox"/>
Heading	90	degrees
Pitch	10	degrees
Roll	10	degrees

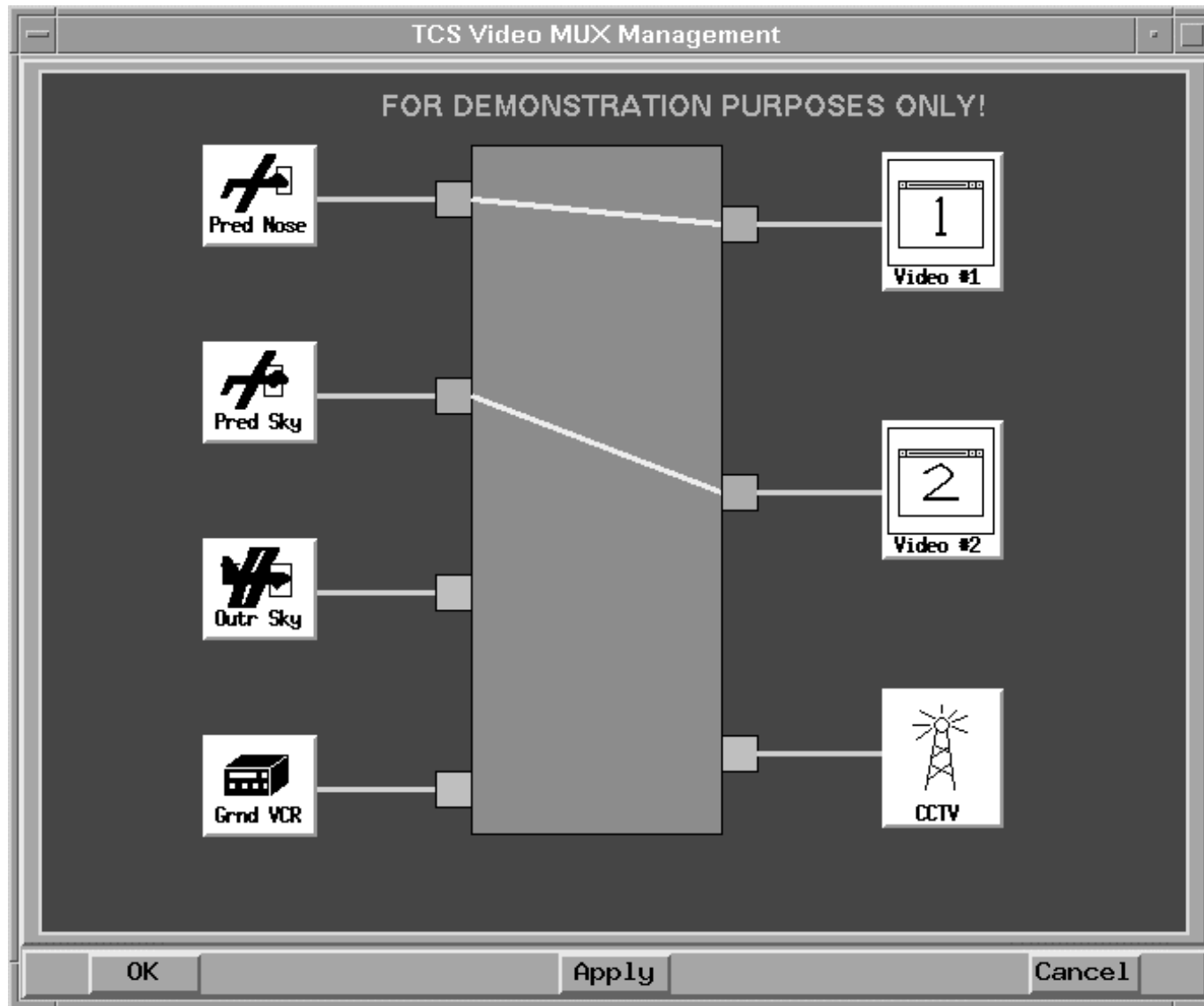


Build 1.1 Screen Shots



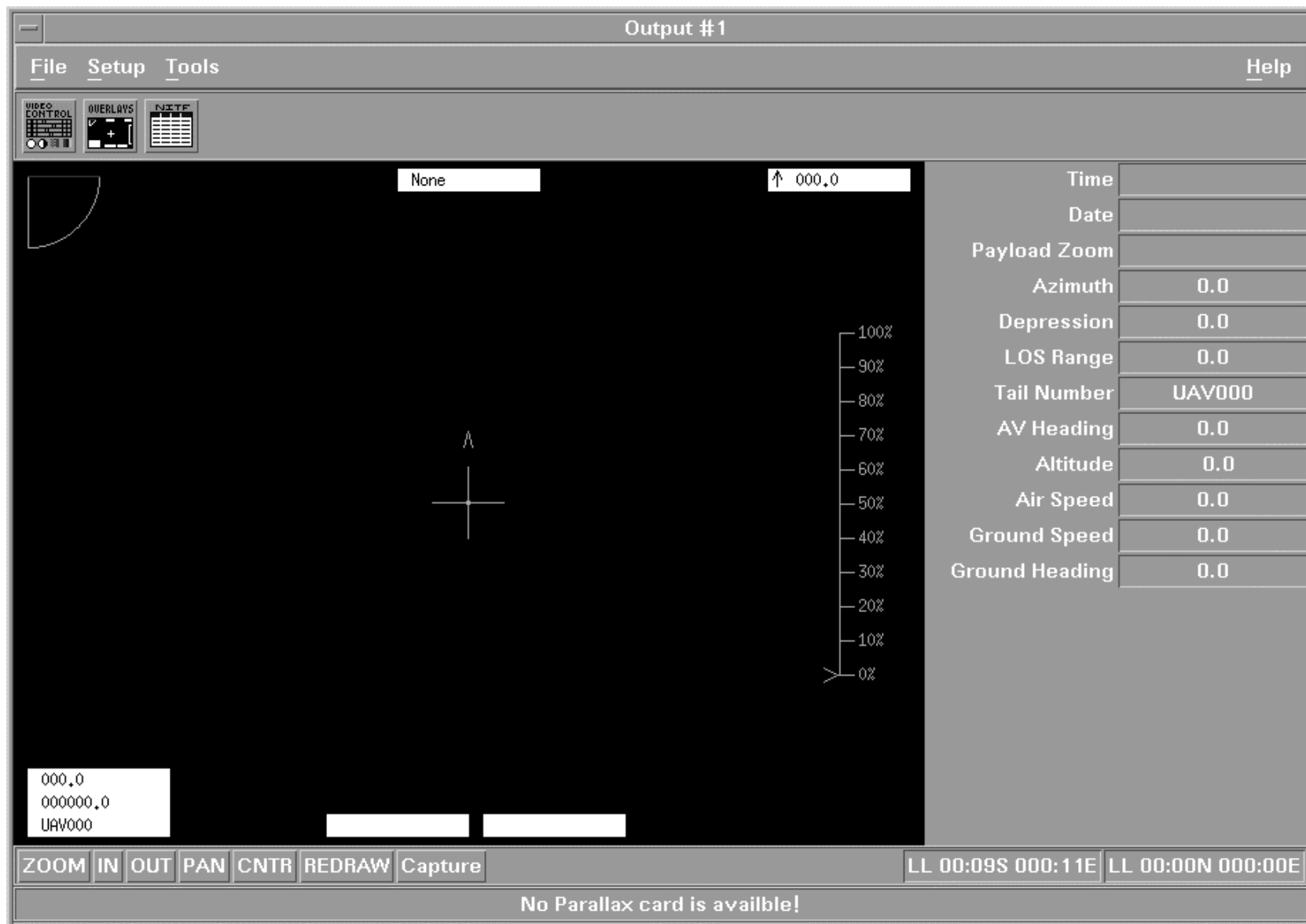


Build 1.1 Screen Shots





Build 1.1 Screen Shots





Build 1.1 Screen Shots

TDBM Entry

Track Type:

Class:

Country Code:

Threat:

Org Type:

Echelon:

Position:

Time:

Heading: Degrees

Speed: Knots

Classification:

Alert Code:

Short Name:

Long Name:

OK Apply Reset Cancel

Enter Long Name

IO	AFD	BRITISH INDIAN OCEAN
IP	NEU	CLIPPERTON ISLAND
IR	SUS	IRAN
IS	AFD	ISRAEL
IT	AFD	ITALY
AMBL		AIR MOBILE
AMBLINF		AIR MOBILE INFANTRY
AAM		AIR-TO-AIR MISSILE
ASM		AIR-TO-SURFACE MISSI
AMPHASLT		AMPHIBIOUS ASSAULT
BDE		BRIGADE
CMBTCMD		COMBAT COMMAND
CMD		COMMAND
CO		COMPANY
CORPS		CORPS



Build 1.1 Screen Shots

TCS – Tactical Message Control

RECCEXREP

RECCEXREP

To:

Route:

Precedence:

Classification:

Name:(Ex/Op) (Supp)

Applicable Tracks:

Track#	Time	Org	Echelon	Position	Hdg	Spd
<input type="text"/>						



Build 1.1 Screen Shots

Antenna Status		
True Bearing To AV	0.0	Degrees
Range To AV	0.0	Miles
Elevation	0.0	Degrees
True Azimuth	0.0	Degrees
Relative Azimuth	0.0	Degrees
Near Lower Azimuth Limit	NO	
Near Upper Azimuth Limit	NO	
Pedestal Temperature	73.4	Deg (F)
Designation	HORN	
Frequency	LOW	
Pointing Mode	MANUAL	
Unwrap In Progress	NO	
Auto Unwrap	OFF	
Initializing	NO	
Error Detected	NO	
Stabilization Mode	SOFTWARE	



Build 1.1 Screen Shots

Antenna Position

Update Mode:

Position: ☐

Altitude: Feet

Heading: Degrees

Antenna Commands

True Azimuth: Degrees

Elevation: Degrees

Designation:

Frequency:

Pointing Mode:

Auto Unwrap:

Force Unwrap:

Azimuth Offset: Degrees

Elevation Offset: Degrees



ISSUES/PROBLEMS

- Initial lack of DII knowledge caused much of the original design concept to be reworked.
- Coming up to speed on the DII COE environment hampered design progress.
- Turnover in HCI design team has hampered progress.
(Core NAWCAD team down to three members. Only one is devoted to TCS full time. Forced to rely on NSWCD S/W personnel for help)



ISSUES/PROBLEMS

- Spending lots of time trying to get clarification on documents (OTA, IDD's, others)
- Lost One of our Electronic Prototype Programmers
 - No new e-prototypes since September
 - Tcl/Tk programmers are not in abundance
 - HCI programmers (who know Tcl/TK are already saturated
- Late arrival of FY98 Funding is inhibiting ability to fill personnel holes (FY97 funding could not be carried over)